

KOMAROV, N.M.; BELYBERDIN, N.S.

Study of the toxic effect of thermomechanical aerosols of
dichloro-diphenyl-trichloroethane (DDT) and hexachlorocyclo-
hexane. Farm. i toks. 26 no.1:113-116 Ja-F '63. (MIRA 17:7)

1. Vsesoyuznyy institut eksperimental'noy veterinarii.

L 16932-46 EWT(1)/ETC(f)/EPF(n)-2/ENG(m) IJP(c) WW/AT

ACC NR: AP6003197

SOURCE CODE: UR/0382/65/000/004/0024/0026

AUTHOR: Balyberdin, V. V.; Papkovich, V. G.

ORG: none

TITLE: Flow of alternating current through a plasma vortex

SOURCE: Magnitnaya gidrodinamika, no. 4, 1965, 24-26

TOPIC TAGS: plasma flow, plasma pinch, plasma magnetic field

ABSTRACT: A solution to the problem of producing strong high frequency magnetic fields of one polarity is considered. An alternating voltage is applied to opposite points on the plasma vortex circumference. The resulting current flow in each branch of the circumference is different; the partition of the current depends on the value of the vortex angular velocity and its electron density. The ratio of conductivities in each branch is derived and the results are graphed. The generation of the periodic magnetic field by such a device was tested. The test apparatus consists of a plasma source and a capacitor bank which provides the voltage applied to the vortex. The electron density of the vortex was determined by a microwave inter-

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UDC: 533.9.082:538.4

L 16932-66
ACC NR: AP6003197

ferometer to be 10^{18} m^{-3} . The oscillograms of the alternating current, which reaches a maximum of 120 ka, is shown together with the Hall signals. It is concluded that such an approach is feasible for the production of the periodic magnetic fields of single polarity. The above device can also be used as an MHD rectifier. In conclusion we wish to express our heartfelt thanks to V. I. Fomenko for assisting in the experiments. Orig. art. has: 5 figures.

SUB CODE: 20/

SUBM DATE: 16May65/

ORIG REF: 001/

OTH REF: 000

Card 2/2 211

L 27062-66 EWT(1)/E (1)/EWT(2)/FCC/EWP(1)/EWA(1)/EWA(1) IJP(6) EM/GW/EM

ACC NR: AF600543

SOURCE CODE: 01/0420/65/000/003/0102/0104

AUTHOR: Balyberdin, V. V.

ORG: none

TITLE: Estimate of the internal energy of a fireball lightning

SOURCE: Samoletostroyeniye i tekhnika vozdushnogo flota, no. 3, 1965, 102-104

TOPIC TAGS: ball lightning, heat of explosion, internal energy

ABSTRACT: The author uses the known physical and chemical properties of fireball lightning and the surrounding medium to estimate its TNT equivalent, with an aim at determining methods of protecting airplane parts against its action. The calculation is based on an observed destruction of a mud hut situated 50 meters from the point of an explosion of a fireball with ~30 cm diameter. An estimate shows that the energy content per cubic centimeter of the fireball is 68 kcal, as against 9.6 kcal for TNT. The results are compared with the energies of certain chemical reactions which can occur in the atmosphere. The relatively small energy of the fireball precludes its being due to thermonuclear fusion. Certain phenomena accompanying fireball lightning, such as penetration through doors and windows without collapsing, are briefly explained. It is suggested that the effect of a fireball lightning might be reduced by coating the airplane with an aqueous solution of metallic salt, which would absorb the energy from the fireball by radiation. Orig. art. has: 4 formulas and 2 tables.

SUB CODE: 19,20/ ORIG REF: 004/ OTH REF: 001/ DATE SUBM: 00

Card 1/1

L 32678-66 EWT(m)/EWP(k)/EWP(t)/ETI IJP(c) JD/RW

ACC NR: AP6006440

SOURCE CODE: UR/0420/65/000/003/0084/0085

AUTHORS: Lopatin, A. I.; Balyberdin, V. V.; Chumachenko, V. S.; Fomenko, V. I.;
Ivanov, G. V.; Trubchaninov, F. A.; Kirichenko, R. F.

ORG: none

TITLE: Radiotechnical method for measuring the motion parameters of the blank during sheet metal stamping

SOURCE: Samoletostroyeniye i tekhnika vozdušnogo flota, no. 3, 1965, 84-85

TOPIC TAGS: metal stamping, test instrumentation, UHF instrument

ABSTRACT: A mostly qualitative description of a radiotechnical method for measuring the displacement of the die during sheet metal stamping is briefly presented. The method consists of attaching a metal "flag" to the die and using this flag to partially block the path between two ultrahigh frequency waveguides, one of which serves as a transmitter and the other as detector. After calibrating the change in transmitted UHF energy as a function of flag position in the gap between the guides, this curve can be used to interpret the die motion (position or velocity) as recorded on an oscilloscope during a stamping operation. Any centimeter range UHF generator can be used. A sample calibration curve and a sample stamping curve are presented without details or specifications as to operating ranges, accuracy, etc. Orig. art. has: 3 figures.

SUB CODE: 13/ SUBM DATE: none/ ORIG REF: 001
Card 1/1 p. 1

L 10789-66

ACC NR: AF6018599

ENT(1)/ENT(m)/EMP(k)/EMP(t)/ETI

IJP(c)

JD/IN

SOURCE CODE: UR/0420/66/000/004/0017/0022

AUTHOR: Balyberdin, V. V.

ORG: Kharkov Aviation Institute (Khar'kovskiy aviatsionnyy institut)

TITLE: Deformation of a twisted flexible conductor by electrodynamic forces

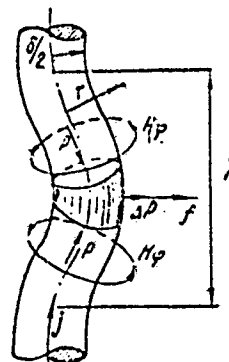
SOURCE: Samoletostroyeniye i tekhnika vozdushnogo flota, no. 4, 1966, 17-22

TOPIC TAGS: plasma electromagnetics, material deformation, electric conductor, vortex

ABSTRACT: The author considers deformation of twisted current lines under the effect of electrodynamic forces as applied to processes in a plasma filament, assuming that these calculations may also be applied to a twisted metallic conductor with the appropriate simplifications. The total force which arises during twisting and acts on the sections of the current line is given by the formula

$$I = \frac{\Delta l}{R} \left(\frac{\pi}{4} \rho \delta^2 + \frac{I^2}{8\pi} \ln \frac{2\lambda}{\delta} \right)$$

where Δl is an elementary section of the twisted current flow, R is the radius of twist and $P_{\pi} = P + \frac{H_{\varphi}^2(r)}{2}$. The notation is ex-



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ACC NR: AP6018599

plained by the figure. A formula is derived for the geometric parameter $\Delta l/R$ which determines force f . It is shown that this force varies along the boundary of the curve which describes the shape of the current line from zero at points of inflection to some maximum value at the apex of the curve. Drift processes in the plasma filament are considered and equations are given for the trajectory of charged particles in a given electromagnetic field. Collisions with charged particles cause circular motion in the boundary layers which is broken up into three vortex rings. Two of these rings move in one direction while the other moves in the opposite direction, but the total momentum with respect to the stationary center is zero. In conclusion I thank Candidates of physicmathematical sciences N. A. Khizhnyak and V. P. Demutskiy, and Candidate of technical sciences G. F. Kovneristov for constructive criticism and assistance with the work. Orig. art. has: 2 figures, 23 formulas.

SUB CODE: 20/09/ SUBM DATE: none/ ORIG REF: 003

Card 2/2 M/LP

L 00152-00

EWI(1)/EWI(m)/T/EWP(t)/ETI/EWP(k) IJP(c) DS/ID/HW

ACC NR: AP6018611

SOURCE CODE: UR/0420/65/000/004/0107/0109

AUTHOR: Lopatin, A. I.; Balyberdin, V. V.; Chumachenko, V. S.; Gurov, V. M.; Trubchaninov, F. N.; Kirichenko, R. F.; Fomenko, F. I.

ORG: Kharkov Aviation Institute (Khar'kovskiy aviatsionnyy institut)

TITLE: Investigation of an ^{2/}electrohydraulic source and some of its potential applications ₁₄

SOURCE: Samoletostroyeniye i tekhnika vozdushnogo flota, no. 4, 1966, 107-109

TOPIC TAGS: electrohydraulic effect, shock wave, electric discharge

ABSTRACT: The authors describe a highly efficient coaxial electrohydraulic source for industrial use. A diagram of the device is shown in figure 1. The annular aluminum electrode² is fastened to textolite base 1 by bolts. Stainless steel electrode 3 is fastened to the base inside the aluminum electrode and located on its central axis. Voltage is fed to the annular and central electrodes from a battery of condensers through a controllable discharger. The electrical discharge between the electrodes develops in the form of individual spark channels. A schematic diagram of the experimental unit used for testing the source is shown in figure 2.

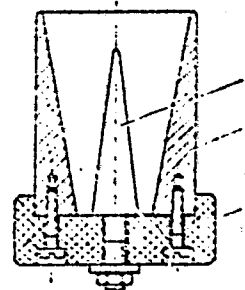


Figure 1

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L 40782-66

ACC NR: AP6018611

Voltage from regulator 1 is fed through step-up transformer 2 and high-voltage rectifier 3 to condenser battery 5 with a total capacitance of 6 μ f. The charging voltage is monitored on electrostatic kilovoltmeter 6. The current in the discharge circuit is registered by a low-inductance Rogowski loop with an integrating circuit connected in the coaxial cable. The signal from this integrating circuit is fed to one channel of an oscillograph. A capacitance signal from the voltage divider is fed to the second channel of the oscillograph through a 75 Ω impedance matching resistor. Analysis of the oscillograms shows that the cyclic frequency of the discharge is 925 Kc while the inductance of the discharge circuit is 0.2 μ h. The current amplitude of the discharge reaches 16 Ka when 10 Kv is applied to the condenser plates. Water velocity is a linear function of discharge voltage with the approximate equation $W=4V+1$, where W is water velocity in m/sec and V is voltage in Kv. At a distance of 3 m

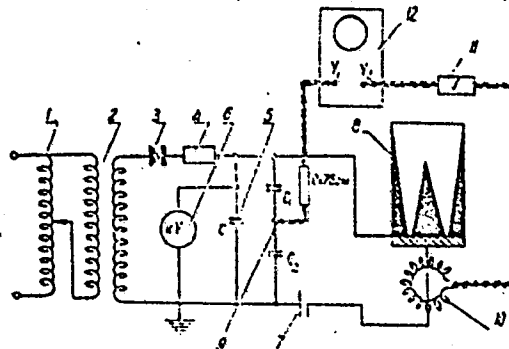


Figure 2: 1--voltage regulator; 2--step-up transformer; 3--20 Kv high-voltage rectifier; 4--60 K Ω discharge resistor; 5--IM-50-3 condenser battery; 6--S-96 kilovoltmeter; 7--discharger; 8--electrohydraulic source; 9--D6-2 voltage divider; 10--Rogowski loop; 11--integrating circuit; 12--OK-17M double beam oscillograph

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ACC NR: AP6018611

from the source, the cross sectional area of the water stream is no more than three times that of the source. Orig. art. has: 4 figures.

SUB CODE: 13/ SUBM DATE: none/ ORIG REF: 007

20/

Card 3/3 *mcp*

ACC NR: AP6030427

SOURCE CODE: UR/0420/66/000/006/0026/0031

66
60
13

AUTHOR: Balyberdin, V. V.; Sabadyr', N. P.; Kazankin, P. A.

ORG: None

TITLE: Investigation of current distribution during formation of an eddy configuration in the atmosphere

SOURCE: Samoletostroyeniye i tekhnika vozdushnogo flota, no. 6, 1966, 26-31

TOPIC TAGS: eddy current, gas discharge, streamline flow, plasma flow

ABSTRACT: The authors investigate the distribution of currents in an eddy configuration, determine the rate of deformation of the stream surface, evaluate the thickness of the skin layer and study the characteristics of the given type of gas discharge. A miniature Rogowski loop was used for determining the rate of deformation of the stream surface, evaluating the thickness of the skin layer and observing eddy currents in the discharge region. The probe was a toroid of 175 turns of PEL-0.07 wire wound on a 0.12 mm core. This spiral was inserted in a copper tube with 0.2 mm walls and an outside diameter of 1.3 mm. The inner surface of the tube was insulated with a layer of enamel. One end of the spiral was soldered to the end of the tube and the other end was passed inside the tube forming coaxial conductors. The copper tube was placed inside a vinyl chloride tube with a sealed end which was twisted into a torus with an

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ACC NR: AP6030427

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inside diameter of 4 mm. The resultant toroidal probe has a coefficient of self-induction of 0.5 μ h. The probe signal was fed to the input of an OK-17M oscillograph. A magnetic probe was used for determining the current boundary of the configuration. This probe was made of 30 turns of PEL-0.09 wire enclosed in a copper tube with an outside diameter of 3 mm which was placed in a glass tube with a diameter of 4 mm with the lower end sealed. An analysis of the experimental data on current distribution during electric discharge of a capacitor battery through a conductive shell around the nose of a body in a streamline flow shows that the discharge current flows along stream lines described by an equation of the type $x = b^{-a}y^a$. Electrodynamic deformation of the lines of flow results in the formation of a spherical vortex plasma configuration. Intense turbulent motion and eddy currents are observed in the plasma of this configuration. In conclusion we are grateful to F. I. Fomenko, V. M. Gurov, V. G. Papkovich, A. A. Vereshchetin and V. F. Mironyuk for assistance in conducting the experiments. Orig. art. has: 9 figures, 3 formulas.

SUB CODE: 20/ SUBM DATE: None

Card 2/2

SPIRINA, A.A.; KAZAKEVICH, N.B.; KMIT, M.I.; SVETOVIDOVA, V.M.; KHAIT, V.S.;
ARONOV, M.S.; BORISKINA, K.I.; PERSHIN, G.N.; BELOZEROVA, K.A.; KARPOV,
S.P.; KOVAL'SKIY, G.N.; RYBKINA, L.G.; BALLYBERDINA, L.D.; AKHMADULLINA,
G.G.; DEMIKHOVSKIY, Ye.I.

Annotations of articles which reached the editorial office. Zhur.mikrobiol.
epid,i immun. no.2:88-89 P '53. (MLRA 6:5)

1. Kurskiy institut epidemiologii i mikrobiologii (for Spirina, Kazakevich and Kmit).
2. Tambovskiy institut epidemiologii i mikrobiologii (for Svetovidova).
3. Kafedra mikrobiologii Odesskogo meditsinskogo instituta (for Khait).
4. Kafedra mikrobiologii i operativnoy khirurgii Kuybyshevskogo meditsinskogo instituta (for Aronov, and Boriskina).
5. Vsesoyuznyy nauchno-issledovatel'skiy khimiko-farmatsevticheskiy institut (for Pershin and Belozeroval).
6. Kafedra mikrobiologii Tomskogo meditsinskogo instituta imeni V.M. Molotova (for Karpov).
7. Tomskiy institut epidemiologii i mikrobiologii (for Karpov).
8. Krasnodarskiy institut epidemiologii i mikrobiologii imeni Savchenko (for Koval'skiy and Rybkin).
9. Kafedra infektsionnykh bolezney Sverdlovskogo meditsinskogo instituta (for Balyberdina).
10. Kazanskiy institut epidemiologii i mikrobiologii (for Akhmadullina).
11. Kafedra mikrobiologii Dnepropetrovskogo meditsinskogo instituta (for Demikhovskiy). (Bacteria, Pathogenic) (Antibiotics) (Phagodytosis)

Ch. L. ...

BALYBERDINA, L. D. and BOGDANOV, I. L. .

"Brucellosis Vaccine Therapy by G. P. Rudnev's Method", Zhurnal Mikrobiologii, Epidemiologii i Immunobiologii, No 6, 1953, pp 25-31

Trans

M-151, 7 Feb 55

Clin. Inf. Dis, Sverdlovsk Med Inst., 1953.

NOTKINA, L.G.; ZAPARA, Ye.M.; GOLUBCHIK, M.G.; Prinimala uchastiye:
BALYBERDINA, L.M.

Production of feed yeast from separation waste liquor.
Sakh. prom. 36 no.7:21-24 J1 '62. (MIRA 17:1)

1. Ukrainskiy nauchno-issledovatel'skiy institut polimeriza-
tsionnykh plastmass.

AUTHORS: Balyberdina S.P., Gitin V.Ya., Greysukh M.A., Dobrer Ye.K.
and Messerman G.T. (Engineers) SOV/110-59-4-21/23
TITLE: Accelerated Methods of Drying 35 - 220 kV Current
Transformers (Metody uskorennoy sushki transformatorov
toka na napryazheniye 35 - 220 kv)
PERIODICAL: Vestnik Elektromyshlennosti, 1959, Nr 4, pp 71-75 (USSR)

ABSTRACT: The drying of current transformers takes up about 40% of the total manufacturing time. This article considers methods of reducing that time. The process of drying insulation is then considered and is sub-divided into the processes of vapourisation of moisture, its displacement within the insulation and its evaporation from the surface of the insulation. To accelerate the drying process it is very desirable to heat the transformer conductors by electric current so that the flow of heat is in the same direction as the flow of moisture. It is often also necessary to heat the outside layers of insulation so that the evaporation is rapid enough. In investigating the process of drying insulation of current transformers the following methods of supplying the windings with current were tried: a.c. supply to the primary with the secondary short circuited, with this method the heat

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Accelerated Methods of Drying 35 - 220 kV Current Transformers SOV/110-59-4-21/23

evolved in the secondary winding is much less than that in the primary and so the secondary does not dry quickly enough; a.c. supply to the secondary winding with the primary winding connected to an inductance, by this method suitable currents can be obtained in both windings and drying is quick; a.c. supply to the primary, with additional d.c. supply to two secondaries connected in series, if they are third and fourth secondary windings they are short circuited and by this means it is possible to accelerate drying of the secondary windings through which d.c. is passed. Both of the last two methods meet the main requirements; the first of the two is simpler but not always applicable when the secondary windings are for a rated current of 1 A, since dangerously high voltages are required. The other method gives uniform heating but the simultaneous use of two kinds of current creates practical difficulties. A table gives types of transformers, rated current, and recommended methods of connection before drying. In order to verify the calculations and to compare various methods of drying, accelerated drying tests were made on current transformers

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SOV/110-59-4-21/23

Accelerated Methods of Drying 35 - 220 kV Current Transformers

for voltages of 35, 110, 154 and 220 kV under laboratory conditions. Thermocouples were installed at several places in the test transformers. The drying process was followed by measurements of dielectric loss and insulation resistance between secondaries and earth. Drying was considered to be complete when the electrical properties of the insulation reached steady values. Graphs of power factor and insulation resistance for current transformers type TFN-35 and TFND-110 are given in Figs 2 and 3 which also give for comparison the corresponding values when the insulation is dried by the current factory procedures. It will be seen from the graphs that the use of electric current to heat the windings has cut the drying time by a factor of 5. Similar measurements made on other current transformers dried by passage of current with the transformer in an

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SOV/110-59-4-21/23

Accelerated Methods of Drying 35 - 220 kV Current Transformers

oven are given in Fig 4 and it will be seen that the
Card 4/4 combined method of drying is both quicker and better.
There are 4 figures, no references.

SUBMITTED: June 3, 1958

BALET-ERDINA-LEVINA, L. D.

"Significance of the Opsonophagocytic Reaction in Diagnosis and Vaccinotherapy of Brucellosis." Cand Med Sci, Sverdlovsk State Medical Inst, Sverdlovsk, 1953. (RZhBiol, No 6, Mar 55)

SO: Sum. No. 670, 29 Sep 55--Survey of Scientific and Technical Dissertations Defended at USSR Higher Educational Institutions (15)

BALYCHEV, O.N.; ZHILKO, E.I.; MAKEYEV, I.F.; SHIBAYEV, I.P.

Command and executive device for automatic control of a charge distributor depending on the gas temperature along the charge hole circumference of a blast furnace. Sbor. trud TSNIICHM no.30:23-27 '63. (MIRA 16:10)

(Blast furnaces—Equipment and supplies)
(Automatic control)

BALICHEV, O.N.; ZHILKO, E.I.; SHIBAYEV, I.P.

Device for an automatic selection of an optimum permissible
deviation of the temperature of charge-hole circumference
from its mean temperature. Sbor. trud TSNIICHM no.30:28-32 '63.
(MIRA 16:10)

(Blast furnaces—Equipment and supplies)
(Automatic control)

BALYER, I.L., inzh.

Automatic line for soldering support plates of radiator cores with
a solder jet. Vest. mashinostr. 44 no.9:58-60 S '64.
(MIRA 17:11)

BALYGIN, I. Ye.

The following is among dissertations of the Leningrad Polytechnic Institute imeni Kalinin;

"Impulse Type High-Voltage Potential Divider." 1 July 1946. A formula is derived for determining the distortion of the impulse form by ohmic dividers. The principle of shielded ohmic and capacitance dividers, as proposed by the author, is described. A combination divider is described and the procedure for the approximate calculation of its compensating capacitances is set forth.

SO: M-1048, 28 Mar 56

<p>681.515.2.087.6 : 681.3.015.5 - 82</p> <p>Some physical phenomena in 35 kV cables in connection with partial breakdowns of insulation. Balygin, I. N. Elektrichestvo (No. 3) 77-8 (Feb., 1946) In Russian. - An investigation of partial breakdowns of 35 kV cables is described, the main parameter being the different heat and ageing treatments given. Dielectric recovery is found to have a considerable effect, and methods of predicting breakdowns by observation of temperature rises are indicated. A. L.</p>		<p>B 64</p> <p>f</p> <p>1700</p>
<p>ASS. SLA METALLURGICAL LITERATURE CLASSIFICATION</p>		<p>22000 2001000</p> <p>2201000 2001000</p>

1ST AND 2ND GROUPS										PROCESSES AND PROPERTIES INDEX										3RD AND 4TH GROUPS									
<p>BALYGIN, I. Ye.</p> <p>SA</p> <p>3199. Behavior of fuses with negative currents of high intensity. Balygin, I. Ye. <i>Elektricheskoe</i> (No. 4) 70-4 (April, 1969) in Russian. Experiments on the "electrical explosion," i.e. instantaneous evaporation of fuse-wires under high intensity current pulses, are described. The fuses were enclosed in vacuum-spark gaps of different types. Oscillograms are given and results described in detail. B. P. K.</p> <p>B 64</p>																													
<p>ASB-31.4 METALLURGICAL LITERATURE CLASSIFICATION</p> <p>FROM: 170.031.01</p> <p>TO: 170.031.02</p> <p>170.031.01 170.031.02 170.031.03 170.031.04 170.031.05 170.031.06 170.031.07 170.031.08 170.031.09 170.031.10 170.031.11 170.031.12 170.031.13 170.031.14 170.031.15 170.031.16 170.031.17 170.031.18 170.031.19 170.031.20 170.031.21 170.031.22 170.031.23 170.031.24 170.031.25 170.031.26 170.031.27 170.031.28 170.031.29 170.031.30 170.031.31 170.031.32 170.031.33 170.031.34 170.031.35 170.031.36 170.031.37 170.031.38 170.031.39 170.031.40 170.031.41 170.031.42 170.031.43 170.031.44 170.031.45 170.031.46 170.031.47 170.031.48 170.031.49 170.031.50 170.031.51 170.031.52 170.031.53 170.031.54 170.031.55 170.031.56 170.031.57 170.031.58 170.031.59 170.031.60 170.031.61 170.031.62 170.031.63 170.031.64 170.031.65 170.031.66 170.031.67 170.031.68 170.031.69 170.031.70 170.031.71 170.031.72 170.031.73 170.031.74 170.031.75 170.031.76 170.031.77 170.031.78 170.031.79 170.031.80 170.031.81 170.031.82 170.031.83 170.031.84 170.031.85 170.031.86 170.031.87 170.031.88 170.031.89 170.031.90 170.031.91 170.031.92 170.031.93 170.031.94 170.031.95 170.031.96 170.031.97 170.031.98 170.031.99 170.031.00</p>																													

BALYGIN, I. Ye.

Cand. Tech. Sci.

"Fuse Operation During High Voltage Impulse Currents," Elektrichestvo, No.4, 1949

BALYGIN, I. YE.

USSR/Physics - Luminescence
Lightning

Jul 49

"Luminescence of the Main Channel of Lightning,"
I. Ye. Balygin, Cand Tech Sci, Sci Res Inst, Min
of Communication Equipment Ind USSR, 4 pp

"Elektrichestvo" No 7

Gives a physical explanation of the phenomenon of
discontinuous luminescence in the main lightning
channel based on representation of the nonstationary
processes in equivalent electrical circuits.

3/50780

BALYGIN, I. YE.

PA 153T33

USSR/Engineering - Ignition, Spark
Sparks, Electric

Nov 49

"Inflammability of Mixtures of Air and Gasoline Vapor
Using Electric Sparks of Limited Power," I. Ye.
Balygin, Cand Tech Sci, Leningrad, 2 pp

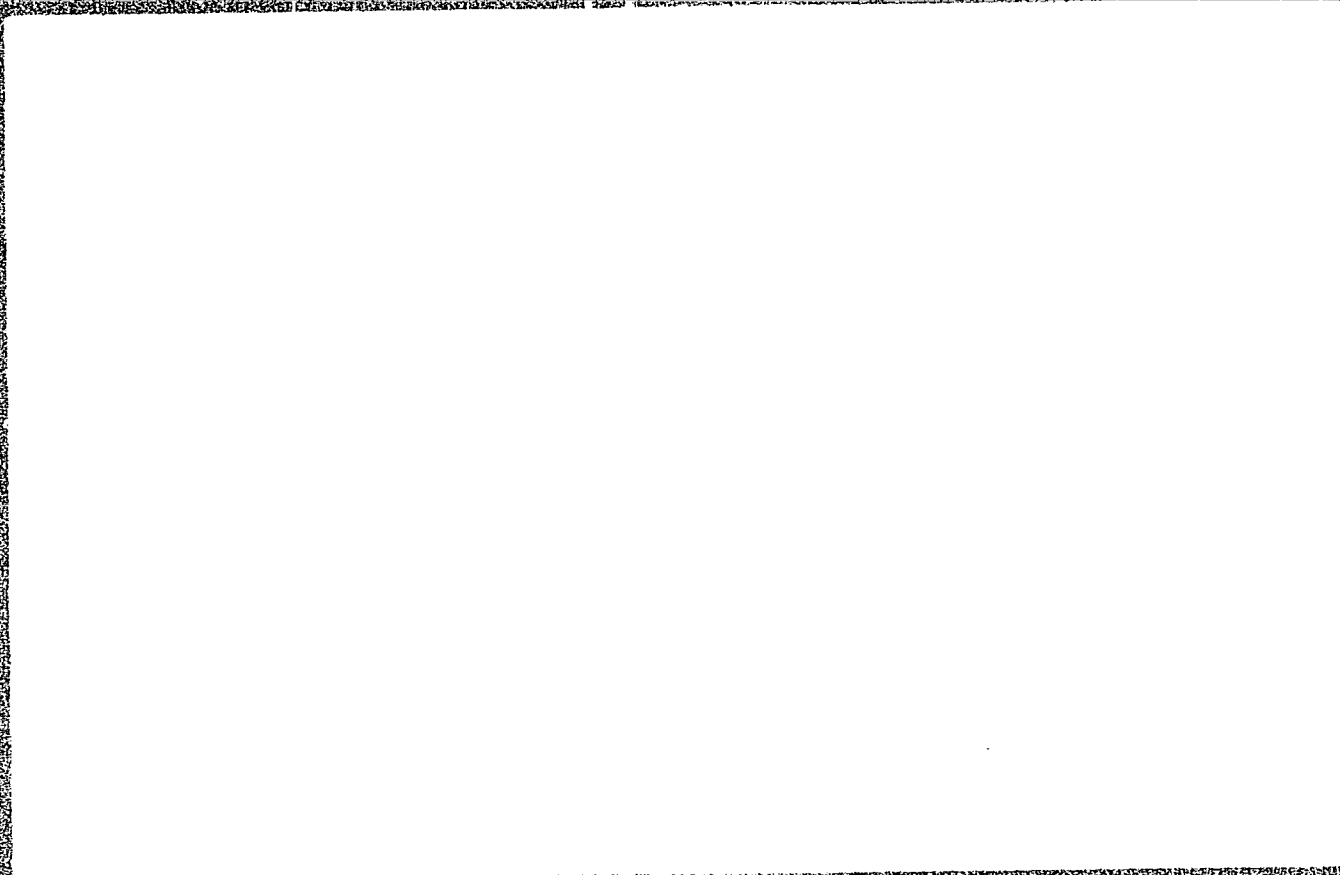
"Elektrichestvo" No 11

Presents results of experiments on ignition of gaso-
line-air mixtures with electric sparks of various
strengths. With a discharge lasting 50 microsec
it was necessary to vary current from 0.0014 to 250
amp to ignite mixtures in the range 1.4-6% gasoline
vapor by volume. Includes five graphs.

153T33

"APPROVED FOR RELEASE: 06/06/2000

CIA-RDP86-00513R000103330005-6

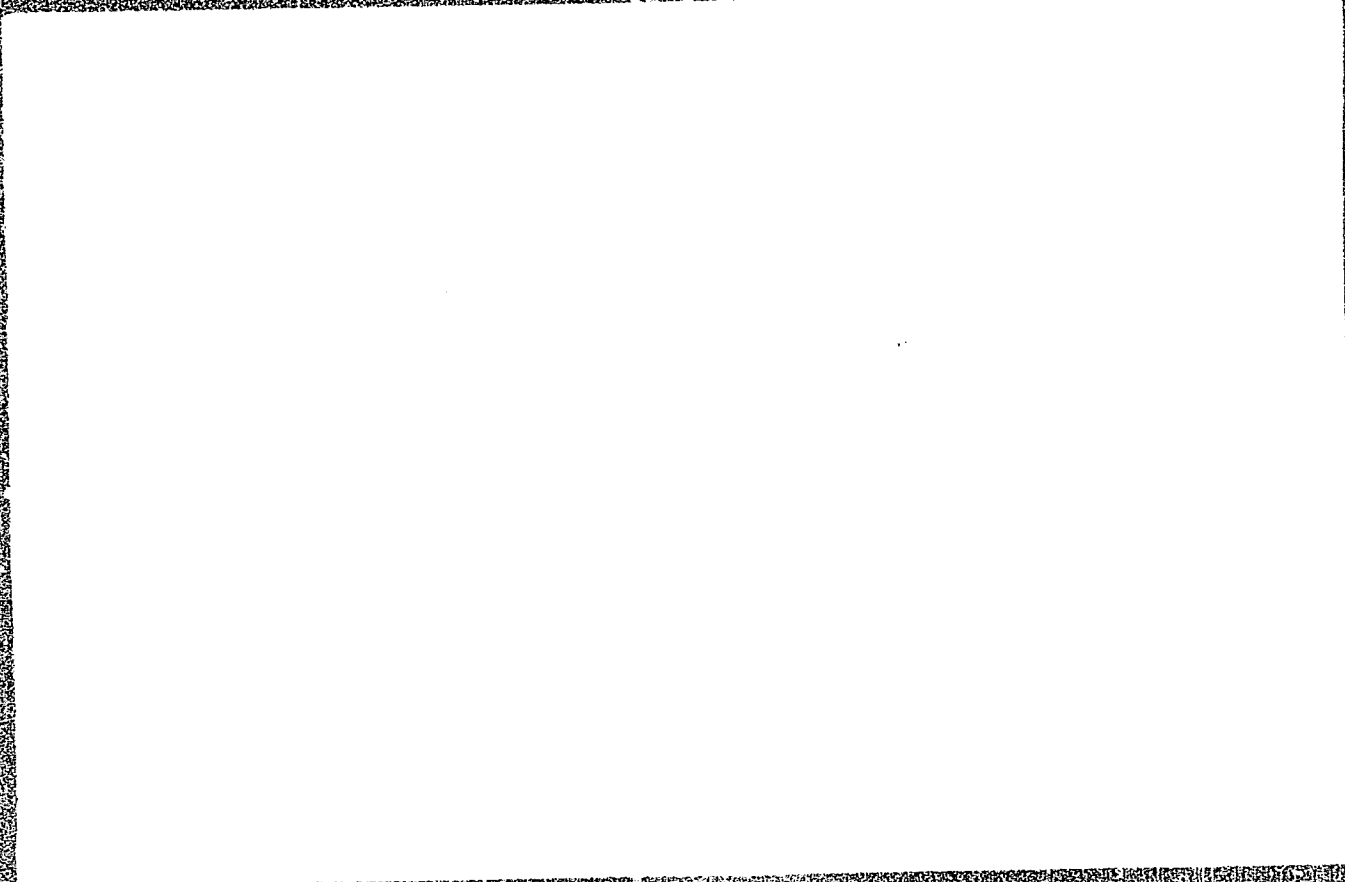


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APPROVED FOR RELEASE: 06/06/2000

CIA-RDP86-00513R000103330005-6"

BALYGIN, I.Ye., kandidat tekhnicheskikh nauk.

Electric rupture of liquid dielectrics. Elektrichestvo no.1:
89-92 Ja '54. (MLRA 7:2)
(Electric insulators and insulation)

BALYGIN. F.E.

12.11.1953, 10

USSR/Physics - Discharge lag

FD-894

Card 1/1 Pub 153-3/26

Author : Balygin, I. Ye.

Title : The lagging time of discharge formation in the air

Periodical : Zhur. tekhn. fiz. 24, 1187-1193, Jul 1954

Abstract : The time interval of discharge formation is studied at various spark gaps and pressures and found to depend on pressure and voltage. At pressures of 400-50 mm Hg the mechanism of discharge formation differs from the Townsend type. Lagging appears when deionization processes slow down the discharge formation. Fifteen references, including 8 foreign.

Institution : --

Submitted : September 23, 1953

BALYGIN, I Ye.

FD 409

USSR/Physics - Spark-over

Card 1/1

Author : Balygin, I. Ye.

Title : Spark-over of small air gaps

Periodical : Zhur. eksp. i teor. fiz. 26, 98-106, Jan 1954

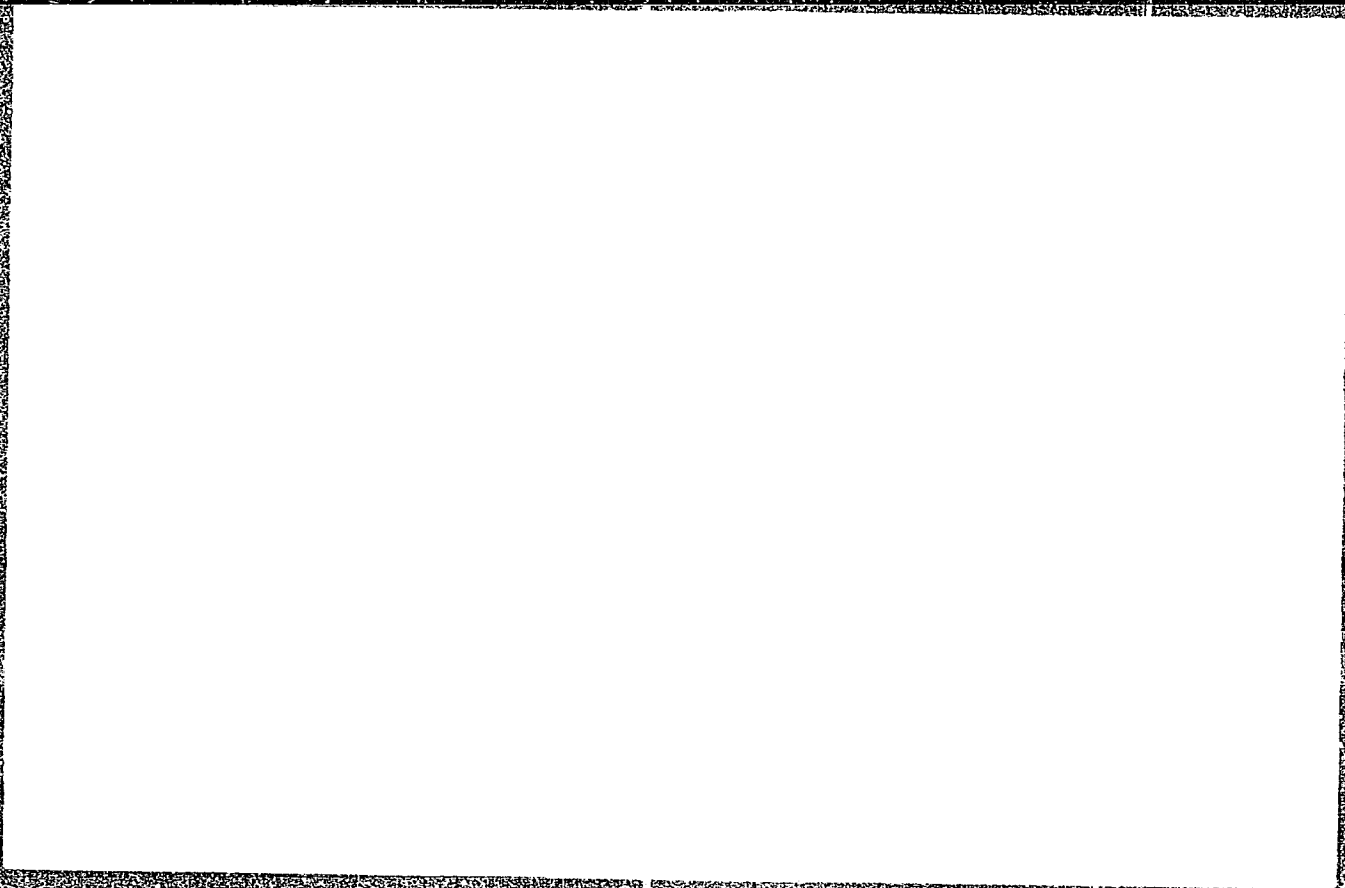
Abstract : Presents experimental data on the spark-over of small air gaps for various limitations of the current of the discharge channel. From the oscillograms of the voltage and current at the moment of rupture and succeeding sparking the author noticed the phenomenon of jump-like deionization of the spark channel. Presents data on the existence under stated conditions of two special regimes. Notes that in recent years the temperature of the discharge channel in certain cases can be made to reach 40,000° by means of impulse voltage gaps (S. L. Mandel'shtam and N. K. Sukhodrev, ZhETF 24, 701, 1953; G. G. Dolgov and S. L. Mandel'shtam, ZhETF 24, 691, 1953).

Institution : Leningrad

Submitted : July 10, 1953

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USSR Physics - Electrolytic deposition

FD-3144

Card 1/1 Pub. 153 - 19/19

Author : Balygin, I. Ye.; Plashchinskiy, N. T.

Title : Electrolytic deposition of alkali metals in glass

Periodical : Zhur. tekhn. fiz., 25, No 9 (September), 1955, 1670-1672

Abstract : The authors state that the formation of dendrites in glass of most diverse composition does not occur during electrolysis (B. I. Markin, ZhOKh, 22, 2, the glass contains metals in the colloidal state and an amalgam of the same metals is applied to the glass in the form of an electrode. In the present note the authors show that the deposition of alkali metals in ordinary glass takes place all the same even at 150°C, but under the prolonged action of a constant and even high-frequency voltage. The authors conducted suitable experiments with ordinary glass 20 mm thick in thermostats maintained at 150°C and with specimens held in steel electrodes (needles) subjected to 15 kilovolts (rectified) and 5.5 kilovolts (2.10⁵ cycles) voltages; the experiments were conducted without interruption around the clock. It was found that in the course of several days samples under constant voltage showed near the cathode deposition of metal in the form of very fine shining discs semicircular, with dimensions gradually increasing with passage of time. 4 ref.

Institution : --

Submitted : May 11, 1955

BALYGIN, I.Ye., kandidat tekhnicheskikh nauk (Leningrad)

Creeping discharges on the surface of transformer oil.
Elektrichestvo no.7:63-65 J1 '56.

(MLBA 9:10)

(Electric discharges) (Insulating oils)

Balygin, I. E.

USSR / Electricity

G

Abs Jour : Ref Zhur - Fizika, No 4, 1957, No 9642

Author : Balygin, I.E., Porovskiy, K.S.

Inst : Not give

Title : Aging of Insulation of Ceramics at High Temperature.

Orig Pub : Zh. Tekhn. fiziki, 1956, 26, No 8, 1714-1722

Abstract : A study was made of the processes of irreversible time change of electric properties of insulation of ceramic insulating materials at constant voltage. Tests were made on "ultra-porcelain" (UF-46), "radio-porcelain," steatite, (B-17), and spinel (sh-15). It is shown that the "ultra-porcelain" can hardly be used at 380° even at an applied field intensity of 100 -- 200 volts/mm. In prolonged tests, there were noticed in the specimens formation of layers of greatly differing colors, this being due to the influence of the

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USSR / Electricity

Abs Jour : Ref Zhur - Fizika, No 4, 1957, No 9642

Abstract : electrolytic processes. A gradual destruction of silver electrodes and a certain deterioration of the dielectric properties (increase of $\tan \delta$ and reduction in resistance) were noted. A spectral analysis of various layers of the specimen disclosed and permitted a study of migration of metallic ions, entering into the composition of the ceramic and also of the ions of the silver electrode and of the ions of bismuth and lead, which are contained in the paste used to coat the electrodes, which pass through the entire thickness of the specimen from the anode to the cathode. The electrolytical processes in "radio-porcelain" are so intense at 380° , that prolonged and reliable operation of the specimens is hardly possible even at field intensities of tens of volts per millimeter. Specimens of steatite can be operated for a long time at 380° with an intensity of 0.4 kv/mm.

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USSR / Electricity

Abs Jour : Ref Zhur - Fizika, No 4, 1957, No 9642

Abstract : Specimens made of spinel were subjected to aging at 280° to a lesser degree than all the other tested materials. They can operate reliably for a long time at 380° at $U = 0.8$ kv/mm. The higher temperature endurance of steatite and spinel relative to the aging of insulation in prolonged action of dc voltage is due to the smaller contents of alkali-metal oxides. Being weakly attached to the ceramic, the alkali ions shift easily and cause a damage to the silver layer of the electrode and irreversible changes in the structure of the ceramic.

Card : 3/3

BALYGIN, I.YE.
USSR/Electricity - Dielectrics

G-2

Abs Jour : Referat Zhur - Fizika, No 5, 1957, 12113

Author : Balygin, I.Ye., Obratsov, A.I.

Inst : -

Title : Dependence of the Dielectric Losses in Ceramic Materials on the Intensity of the Electric Field.

Orig Pub : Zh. tekhn. fiziki, 1956, 26, No 9, 1917-1923

Abstract : A dependence of the tangent of the angle of dielectric losses ($\tan \delta$) on the intensity of the electric field (E) was measured at a frequency $f = 50$ cycles at various temperatures, in many ceramic dielectrics: "ultra-porcelain" (UF-46), "radio"porcelain, radio-steatite (D-17), thermokond (T-20), tikond (T-80), and tikond (T-150). It is shown that the relation $\tan \delta = \varphi(E)$ is different for each material. Empirical formulas are proposed for expressing this relation.

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1. The first step is to identify the problem. This involves understanding the current situation and what needs to be changed.

BALYGIN, I.Ye., kandidat tekhnicheskikh nauk; PLASHINSKIY, N.T., inzhener.

Aging of ceramic materials due to the effect of constant voltage.
Vest.elektroprom. 27 no.12:34-37 D '56. (MLRA 10:1)
(Electric insulators and insulation--Testing)

BALYGIN, I. Ye.
USSR/Electricity & Dielectrics

G-2

Abs Jour : Ref Zhur - Fizika, No 3, 1957, No 6945

Author : Balygin, I. Ye.

Title : Processes in Liquids Just Prior to a Discharge.

Orig Pub : Zh. eksprim. i teor. fiziki, 1950, 30, No 3, 464-470

Abstract : Pre-discharge processes in transformer end castor oils, in xylol, end in distilled water have been investigated. It was established that at breakdown voltages within shock ionization, the electron showers, end low-power streamers appear within the duration of the statistical time delay.

Card : 1/1

AUTHOR: BALYGIN, I. E., PLASECHINSKIY, N. T. PA - 2178
 TITLE: Ceramic Materials Electro-Conductivity under Strong Electric Fields (Elektroprovodnost' keramicheskikh materialov v silnykh elektricheskikh pol'yakh, Russian)
 PERIODICAL: Zhurnal Tekhn. Fiz. 1957, Vol 27, Nr 1, pp 138-146 (U.S.S.R.)
 Received: 2 / 1957 Reviewed: 4 / 1957
 ABSTRACT: The authors determined the dependence of $\sigma=f(E)$ on the following discussed substances (here σ denotes conductivity and E field-strength):
 I) Ultrafarfor: The curves $\sigma = f(E)$ are given. At 23°C and 73°C and obviously also at somewhat higher temperatures the optic law applies (σ does not depend on E) within range of the field strength 7-250 kV/cm. The disruptive field strengths E_{du} amounted to from 260 to 270 kV/cm. In the cases of the investigated temperatures ultrafarfor is assumed to have an ion-like conductivity. With rising temperature deviation from OHMS'S Law in the case of smaller field strengths takes place as temperature rises.
 II) In the case of spinell σ does not depend on E in the temperature range of from $23-295^{\circ} \text{C}$, and therefore OHMS'S Law applies in this domain up to field strengths of 230 kV/cm. Conductivity is here without doubt ion-like and the disruptive voltage of spinell amounts to from 230 to 240 kV/cm.
 III) In the case of thermokond T - 20 OHMS'S Law applies only at temperatures below 100°C within the entire investigated range of

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PA - 2178

Ceramic Materials Electro-Conductivity under Strong Electric Fields.

field strengths. The disruptive voltage amounts (in the case of small drawn tubes from T-20) to from 160 to 170 kV/cm at from 20 to 180° C. Numerical data are given in tables and diagrams (as also in the case of other substances discussed).

IV) Tikond T-75 differs to a great extent from the discussed materials, for OHM'S Law applies at $t=22^{\circ}$ C only in the case of field strengths of up to 45 kV/cm; in the case of higher field strengths σ increases comparatively steeply.

V) In the case of tikond T-80 amperage drops abruptly within 10 to 30 microseconds after the switching on of the voltage. This is explained by the effect of the spatial charge of electrons which are kept back on the local energy levels at the places of destruction of periodicity in the ceramic structure. (11 illustrations).

ASSOCIATION: Not given
PRESENTED BY:
SUBMITTED: 11.6.1956
AVAILABLE: Library of Congress

Card 2/2

BALYGIN, I. Ye.

AUTHOR:
TITLE:

BALYGIN, I. E., and POROVSKIY, K. S.

PA - 2541

Influence of Electrode Constituent on Ceramic Dielectrics
Isolation Ageing. (Vliyaniye metalla elektrodov na stareniye
izolyatsii keramicheskikh dielektrikov, Russian)
Zhurnal Tekhn. Fiz, 1957, Vol 27, Nr 3, pp 513 - 515 (U.S.S.R.)
Reviewed: 5 / 1957
Received: 4 / 1957

PERIODICAL

ABSTRACT:

A short report concerning the results of endurance tests of models of the ceramic mass KM-1 (consisting chiefly of Al_2O_3 and SiO_2 with small additions of BaO, CaO, SrO etc) and the statite-mass STs-4 (chiefly of SiO_2 and MgO with small additions of BaO, Al_2O_3 , ZnO etc). The dielectric transmissivity at 1 MHz frequency is in the first case 7.2, in the second 6.7. The tests were carried out at a temperature of from 390 - 400° C. The electrodes were applied by burning in silver at 800° C and Platinum at 900° C. In the case of most samples electrodes of different metals were applied. Results are shown in a table. It may be taken for granted that the main part of the aging of the insulation and the deterioration of its electric properties in the case of some ceramic insulators is due to silver penetrating into the thickness of the ceramic. In comparison platinum silver has a higher diffusion-rate with respect to some ceramic-sorts. The irrever-

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57-4-12/36

AUTHOR

BALYGIN, I.Ye.

TITLE

Some Peculiarities of Dendrite Growth at Temperatures of 200°C and 300°C in Rock Salt Crystals

(O nekotorykh osobennostyakh rosta dendritov pri temperaturakh 200 i 300 ° C v kristallakh kamennoy soli. Russian)

PERIODICAL

Zhurnal Tekhn. Fiz. 1957, Vol 27, Nr 6, pp 1229 - 1232 (U.S.S.R.)

ABSTRACT

The experiments carried out showed that at relatively low voltages and temperatures of 200 and 300 ° C the intensity of dendrite growth in NaCl crystals depends upon the electrode material, and, besides, that the process itself, shows a series of specific peculiarities which cannot be explained by a depositing of the ions on the cathode. Experiments were carried out by means of electrodes of negative needles and surface as well as with two needles. At 200 ° C and 12 kV simultaneously four samples with needles of Fe (steel), Ag, W and Mo were tested. It was shown that at voltages which are very far from breakdown voltages and at 200 ° C dendrites form as well, their growth intensity, however, is very low and depends upon the material of the negative needle. At 12 kV and 300 ° C crystals with cubic surfaces ~50 mm and needles consisting of Fe, Ag, W, Mo and Al were investigated. The same surface served as a second electrode. It was shown that at an increase of temperature of 100 ° C the intensity of the dendrite growth increased considerably.

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57-6-12/36

Some Peculiarities of Dendrite Growth at Temperatures of 200°C and 300°C in Rock Salt Crystals

NaCl crystal which, beforehand, had been split and put together again, was investigated by means of an Mo-needle. It was found that the dendrites grow only up to the gap formed and do not penetrate any further. The interior gap in the crystals apparently possess other properties as they do not prevent the growth of the dendrites. (With 1 photograph and 10 Slavic references).

ASSOCIATION
PRESENTED BY
SUBMITTED
AVAILABLE

Not given
28.6.1956
Library of Congress

Card 2/2

AUTHOR: Balygin, I. Ye.

57-10-14/33

TITLE: The Breakdown of Insulating Liquids at the Limitation of Current in the Discharge Channel (Proboy izoliruyushchikh zhidkostey pri ogranichenii toka v razryadnom kanale).

PERIODICAL: Zhurnal Tekhn. Fiz., 1957, Vol. 27, Nr 10, pp. 2291-2302 (USSR).

ABSTRACT: Experiments are described in order to answer the question at which amperage of a discharge current a discharge can still take place continuously and which physical accordances to a rule apply for the discharges suppressed in liquids. Special attention was here paid to the processes connected with the combustion of the spark and the discharge dynamics after the final breakdown is finished. Following liquid dielectrics were investigated. 1) Xylol which is distilled under the removal of the light fractions and filtered twice. 2) Castor oil, dried and filtered in vacuum. 3) Transformer (condenser) oil which is especially cleaned. 4) Pentachlorodiphenyl ("sovol"), also dried in vacuum. On the strength of the investigations it is evidenced that the characteristic properties of the liquids are reflected to a greater extent in the discharge dynamics after the final breakdown is finished than in the amount of the breakdown voltage. To such an extent as a part of the thermal energy which is

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The Breakdown of Insulating Liquids at the Limitation
of Current in the Discharge Channel.

57-10-14/33

liberated by the breakdown is usually used for the warming of electrodes, the spark temperature, the occurrence of spikes, the time when the discharges stop and some other parameters have to depend on the electrode form and the spark gap length. In the case of a noticeable influence of spatial charges on the dynamics of the discharge the latter has to be determined by the geometry of the electric field. This all is also observed in the experiment. There are 8 figures, 4 tables, 8 Slavic references.

SUBMITTED: . May 4, 1957.

AVAILABLE: Library of Congress.

Card 2/2

BALYGIN, I. Ye.

Balygin, I. Ye. Electrical Breakdown of Titanium-containing Ceramic Materials With Dielectric Constant 80

Balygin, I. Ye. Some Process in the Electrical Breakdown of Liquid Dielectrics

(The Physics of Dielectrics; Transactions of the All-Union Conference on the Physics of Dielectrics) Moscow, Izd-vo AN SSSR, 1958. 245 p. 3,000 copies printed.

This volume publishes reports presented at the All-Union Conference on the Physics of Dielectrics, held in Dnepropetrovsk in August 1956 sponsored by the "Physics of Dielectrics" Laboratory of the Fizicheskii institut imeni Lebedeva AN SSSR (Physics Institute imeni Lebedev of the AN USSR), and the Electrophysics Department of the Dnepropetrovskiy gosudarstvennyy universitet (Dnepropetrovsk State University).

NOV/1958-5-8/55

AUTHOR: Balygin, I. Ye.

TITLE: On the Breakdown Mechanism of Thermocond (O mekhanizme proboya termokonda)

PERIODICAL: Izvestiya vysshikh uchebnykh zavedeniy, fizika, 1958, Nr 5, pp 41-47 (USSR)

ABSTRACT: Thermocond T-20, whose dielectric breakdown behaviour was investigated, has the following chemical constitution: ZrO_2 (46.3%), TiO_2 (34.1%), SiO_2 (8.1%), BaO (5.5%), Al_2O_3 (5%), CaO (0.3%) and $K_2O + Na_2O$ (0.42%). The normal bulk value of its dielectric constant is about 20 and is relatively insensitive to temperature. Samples of the material in the form of cylinders about 35 mm diameter and varying thicknesses were located between a pair of condenser plates across which were applied pulses of high frequency voltage. Facility was also available for heating the assembly. Potentials of up to 30 kV at frequencies of around 10^8 c/s were available from a high tension set, and were applied in millisecond bursts at intervals ranging from 10 to 20 seconds. Results are presented for the electric field values at which dielectric breakdown occurred for samples of various thicknesses (ranging from 1.55 mm to 1.96 mm) and at

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On the Breakdown Mechanism of Thermocond

two different temperatures (20°C and 160°C). The values of breakdown field were found to be distributed between 11 kV/mm and 6.4 kV/mm, but more than half were in the range 10-11 kV/mm. No significant trend with specimen thickness or temperature was evident; however, the poor statistics would have tended to obscure any such trend. Where readings were taken for secondary or tertiary punctures of the same sample the breakdown voltage was in general slightly lower than for the first puncture, but again the difference was not statistically significant. A qualitative theoretical interpretation of the results is proposed in terms of 'canals' of relatively low resistance. Such a canal could originate at a large discontinuity in the grain structure of the material (a microphotograph of Thermocond... emphasizes this point). Extremely high fields - much larger than the bulk breakdown field - could build up in the vicinity of such discontinuities, for very short times, and these would induce a change in the local granular structure tending to reduce the field. A series of such structural distortions arranged in a more or less continuous line across the thickness of the sample would constitute a "canal", leading to breakdown. In general, repeated

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SOV/159-58-5-8/35

On the Breakdown Mechanism of Thermocond

application of the high-frequency voltage is required before a canal will build up, but this depends very much on the grain structure. Further experiments are contemplated in which the grain structure is varied in a controlled way. The paper contains 5 figures (including the above-mentioned micro-photograph and some oscillograms of the voltage at the time of breakdown); there are 1 table and 3 Soviet references. The work was first reported at the Conference of Higher Educational Establishments on Dielectrics and Semiconductors, Tomsk, February, 1958.

ASSOCIATION: Nauchno-issledovatel'skiy institut (radiodetal'nyy MRTF)
(Scientific Research Institute for Radio Parts of the MRTF)

SUBMITTED: March 3, 1958.

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BALYGIN, I. Ye.

I. Ye. Balygin and A. P. Rumyantsev reported on the investigation of the dissolution processes of the silver isotope Ag110 in amorphous and crystalline quartz, and in agglomerated oxides as Al_2O_3 , ZrO_2 and TiO_2 .

Report presented at a Conference on Solid Dielectrics and Semiconductors,
Tomsk Polytechnical Inst., 3-8 Feb. 58.
(Elektrichestvo, '58, No. 7, 83-86)

AUTHOR: Kuchin, V. D., Candidate of Technical Sciences SOV/105-58-7-24/52

TITLE: Conference on Solid Dielectrics and Semiconductors (Konferentsiya po tverdyim dielektrikam i poluprovodnikam.n)

PERIODICAL: Elektrichestvo, 1958, Nr 7, pp. 85 - 85 (USSR)

ABSTRACT: The conference took place from February 3rd to February 8th, 1958, in the Tomsk Polytechnical Institute, Section of Breakdown of Solid Dielectrics and Semiconductors. I.Ye.Balygin, Candidate of Technical Sciences (Leningrad), reported that from the calculation data of the resistance of the discharge channel and on the basis of the obtained oscillographs he could draw final conclusions concerning the dynamics of the development and the physical nature of the breakdown of titanium-containing ceramic material with $\epsilon=20$. G.A.Vorob'yev (TPI), Candidate of Technical Sciences (TPI) constructed an oscillograph with pulse feeding. This oscillograph permits the reliable registration of phenomena of a duration of 10^{-9} sec. M.A.Mel'nikov (TPI) found that the electric strength and the time of lagging of the discharge in

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Conference on Solid Dielectrics and Semiconductors

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the breakdown of NaCl-, KCl-, KBr-, KJ crystals and methylmethacrylate crystals with pulses of a front length of $(5 - 7) \cdot 10^{-9}$ sec are almost independent of the chemical composition. A.V. Astafurov (TPI) reported on voltage vs. time characteristics and the dependence of the breakdown voltage on the thickness in the electric breakdown of solid dielectrics of considerable thickness (2 - 34 mm). The applicability of the empiric formula of Gorev-Mashkilevson for the latter is shown. G.A. Andreyev (TPI) found by means of the double-ray oscillograph that the temperature dependence of the electrical strength on NaCl, KCl and KBr has a maximum in the case of a breakdown due to thermal instability in the range of room temperatures. V.D. Kuchin (TPI) found, proceeding from the single electron model, the dependence of the electrical strength on the temperature in the following form: $F^*(T) = kT/2e\lambda(T)$, where λ denotes the free length of path of the electron. K.K. Sonchik (TPI) found that the time of lagging of the discharge in the ion crystals is the shorter, the higher the excess voltage at the sample and the crystal lattice energy are. M.P. Tonkonogov and Ye.T. Nadirov (Karaganda Mining Institute) investigated the destruction of coal by an electrohydraulic shock.

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The calculation showed that the discharge channel formed in the breakdown of the water is the source of the shock wave which destroys the coal. V.I. Obukhov (TPI) showed that the introduction of 0 - 10% solid powdery dielectrics into transformer oil, castor oil, glycerin, and distilled water influences to a very small extent the amount of the resistivity to electric pulses. The strength of the systems is to a great extent increased in the case of a content of admixtures of 30%.

ASSOCIATION: Tomskiy politekhnicheskii institut (Tomsk Polytechnical Institute)

1. Dielectrics--USSR
2. Semiconductors--USSR
3. Conferences

Card 3/3

AUTHORS: Balygin, I. Ye., Porovskiy, K. S. SOV/57-58-8-11/37

TITLE: On the Temperature Dependence of the Electric Strength of Fluoroplast (O temperaturnoy zavisimosti elektricheskoy prochnosti ftoroplasta)

PERIODICAL: Zhurnal tekhnicheskoy fiziki, 1958, Nr 8, pp. 1679 - 1683 (USSR)

ABSTRACT: Fluoroplast -4 (FP-4) is a polymer of polytetra-fluoro ethylene ($CF_2 = CF_2$). In this paper data concerning the temperature dependence of the breakdown voltage in fluoroplast at a constant, at an alternating (50 c) and at a high-frequency voltage are given. Special electrodes mounted on holders of micalex (mikaleks) and a furnace for the electrodes was constructed for the experiments. As can be seen from the curves obtained the breakdown voltage of the film is hardly dependent upon temperature. When the number of layers in the film is increased the breakdown voltage also rises. This tends to show that the probability of a coincidence of the weak spots in the insulation is reduced when the layers are superimposed. The most pronounced drop of the breakdown voltage occurs

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On the Temperature Dependence of the Electric
Strength of Fluoroplast

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above 200°C. This rule is only broken by the breakdown voltage $E_{\text{breakdown}} = f(t)$ of one single layer, as in this case the dependence is linear. Formulae permitting to compute the breakdown voltage in fluoroplast in the range from 25 - 300°C are presented. For the sake of comparison the experimental data are given. A limit of the breakdown voltage is reached with a number of 8-9 layers. Now the curves showing the function of the breakdown voltage versus the total thickness of the packet at the respective temperatures are given. It was found that fluoroplast films heated to 200°C and above are cracked in cooling down. The breakdown voltage is dependent upon the electrode surface S when the number of layers is small. In order to arrive at definite conceptions concerning this phenomenon films were disrupted with electrodes from aluminum foils, the films having a thickness of 7-8μ. It appeared that such a function $E_{\text{breakdown}} = f(s)$ actually exists. The breakdown voltage in fluoroplast decreases at high frequency. Breakdown experiments were conducted in various liquids. These experiments substantiated the assumptions

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On the Temperature Dependence of the Electric
Strength of Fluoroplast

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concerning the development of breakdowns in the micro-fissures. When the number of layers is greater than three the breakdown voltage remains almost constant. The curves obtained show that the breakdown voltage is markedly dependent upon temperature at a constant voltage and at an alternating voltage of 50 c. There are 7 figures, 2 tables, and 8 references, 4 of which are Soviet.

SUBMITTED: July 11, 1957

Card 3/3

AUTHORS: Balygin, I. Ye., Mikhaylov, P. S.

SOV/57-58-8-12/37

TITLE: On Ionization Processes in Pores of Ceramic Dielectrics (Ob ionizatsionnykh protsessakh v porakh keramicheskikh dielektrikov)

PERIODICAL: Zhurnal tekhnicheskoy fiziki, 1958, Nr 8, pp. 1684 - 1691 (USSR)

ABSTRACT: This is a study of normal, and for the sake of comparison also of porous samples of ultraporceleine (U F-46) of steatite STs-4 and of tikond T-150. The dielectric losses were measured, the samples were tested in long-term experiments in a heated state and in high-frequency circuits with $2 \cdot 10^5$ c and the discharge in the gas pores of the sample were recorded. The evidence presented permits to draw the following conclusions: 1) Ionization processes in gas pores of ceramic samples occur only rarely at a d.c. voltage and thus hardly become manifest. They gain importance apparently only in cases where the conductivity of the pore walls is considerably increased. 2) Discharges in gas pores with a diameter of a few hundredths of a millimeter proceed with a small heat transfer. The magnitude of the applied field strength plays an important role in this

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On Ionization Processes in Pores of Ceramic
Dielectrics

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process. If the field strength is raised above a certain value the heating of the samples is considerably increased.
3) It is possible to measure the beginning of the ionization in the gas pores and the beginning of the incomplete breakdown in general by means of a special amplifier equipment. Such measurements with an alternating voltage permit to estimate the qualification of the product for high-frequency equipment. There are 10 figures, 3 tables, and 5 references, 4 of which are Soviet.

SUBMITTED: November 26, 1956

Card 2/2

AUTHORS: Balygin, I. Ye., Flashchinskiy, N. T. SOV/57-58-8-13/37

TITLE: Aging of Ceramic Dielectric Insulation Subjected to High-Frequency Voltages (Stareniye izolyatsii keramicheskikh dielektrikov pri napryazhenii vysokoy chastoty)

PERIODICAL: Zhurnal tekhnicheskoy fiziki, 1958, Nr 8, pp. 1692 - 1695 (USSR)

ABSTRACT: In order to obtain supplementary evidence concerning the aging and a number of parameters determining this process experiments were conducted at $2 \cdot 10^7$ c. Series of samples of the following radio-ceramic substances were tested at 20, 100, 150, 200 and 290°C, at various voltages for 4500 hours: ultraporcelaine (UF-46), radio-porcelaine (RF), radio steatite (B -17), spinel (Sh-15), thermokond T-20, tikond -80, and tikond T-150. The investigations were carried out in special thermostats with an automatic temperature control. The destructive processes in the insulation develop gradually. Their intensity is highly dependent upon the field strength of the high-frequency field and upon the temperature of the surrounding medium. The influence of the chemical composition of the ceramic substance and its structure also has a

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Aging of Ceramic Dielectric Insulation Subjected to
High-Frequency Voltages

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noticeable effect. On the strength of the experimental evidence it can be maintained that the samples of the first four ceramic substances listed above mainly broke down by thermal disruptions which were prepared by ionisation processes in great pores. It is believed that because of the temperature rise of the pore wall and because of the ion bombardment the ceramic particles are sublimated and narrow channels are formed in the direction of the field. The values of $\tan \delta$ in the first two samples amounted to $3 \cdot 10^{-3}$ and $7,8 \cdot 10^{-4}$, respectively. The magnitudes of $\tan \delta$ and ϵ do not vary in all ceramic substances listed above during the whole experiment apart from their variation with the temperature of the surrounding medium and with the field strength. There are 2 figures, 2 tables, and 1 reference, 1 of which is Soviet.

Card 2/2

AUTHORS:

Skanavi, G. I., Balygin, I. Ye., Tolpygo, K. B. 48-22-4-4/24

TITLE:

Discussion on Lectures by V. A. Chuyenko, Yu. I. Gorkun, and K. B. Tolpygo (Preniya po dokladam: V. A. Chuyenkova; Yu. I. Gorkuna i K. B. Tolpygo)

PERIODICAL:

Izvestiya Akademii Nauk SSSR, Seriya Fizicheskaya, 1958
Vol. 22, Nr 4, pp. 383-385 (USSR)

ABSTRACT:

The following scientists participated in this discussion: G. I. Skanavi, I. Ye. Balygin, K. B. Tolpygo and V. A. Chuyenkov. G. I. Skanavi made a few general remarks as to the role of impact ionization in the breakdown and in reference to the interrelation breakdown voltage with the lattice energy. Without doubt the breakdown of a solid dielectric shows two stages. Unfortunately, no experiment is known at present which permits to separate these two stages accurately. In the experimental investigation of the dielectric strength. No doubts exist at present as to the fact, that the initial stage of breakdown is conditioned by electron processes. The lecture on the polaron state of electrons (by Gorkun and Tolpygo) is interesting, because it represents the first attempt to compute the polaron states in the process of electric breakdown. The crit-

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Discussion on Lectures by V. A. Chuyenko, Yu. I. Gorkun, and 48-22-4-4/24
K. B. Tolpygo

erion by Khippel' applied in this paper, will at present be hardly usable. It is not possible to investigate one single electron, it is, on the contrary, necessary to investigate the electron collective, and in consequence, the distribution function. Skanavi with respect to the paper by Chuyenkov makes the statement, that in spite of some difficulties it leaves satisfactory impression, showing less concessions than other papers. I. Ye. Balygin criticises the paper by Tolpygo and Gorkun. He states, that the neglections made by them are so great, that the polaron theory has created even greater discrepancies between theory and experiment than is the case with other theories. Also the theory by Chuyenkov of the valence crystals is calling for contradictions. The assertion, that energetical losses of the electron in the scattering on lattice vibrations is independent from its velocity is considered to be impossible. The here given theories also do not show the interrelation of the breakdown voltage with temperature. It must be mentioned, that in taking into consideration statistical fluctuations the criteria by Khippel' and Frelikh coincide. K. B. Tolpygo is of opinion, that the correspondence of theory with experiment represents a convincing criterion, if only the theory itself contains no contradictions. If this

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Discussion on Lectures by V. A. Chuyenko, Yu. I. Gorkun,
and K. B. Tolpygo

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is not the case, an agreement with experiment is illusory, because essentially in the theory an error of unknown magnitude has occurred, which sometimes is able to basically change the result. It is obvious, that the zero-th approximation of the theory is absolutely inadequate. Therefore, the computations of the energy losses in this approximation cannot be correct. The zonal state of the electrons is not steady, and therefore every electron very quickly loses its initial velocity and transforms into a polaron, which penetrates into the crystal or which is formed because of impact ionization or because of photoeffect (within 10^{-12} sec. that is the vibration period of the lattice). It possesses a great effective mass and a considerable free length of path. Therefore the polaron theory is free of the contradictions of zonal theory. The polaron theory should only be applied in the description of the conditions previous to breakdown. Chuyenkov mentioned, that in the statistical treatment the low number of the zonal electrons plays a considerable part, the energy of which is by $0.15-1.2$ eV greater than that of the immovable polaron. The problem, however, proves to be much more complicated. A zonal electron

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Discussion on Lectures by V. A. Chuyenkov, Yu. I. Gorkun, 48-22-4-4/24
and K. B. Tolpygo

with low energy is not steady; in order to settle this dispute it would be necessary to investigate the behaviour of even faster polarons with energies of 0,5 eV and to determine the limit, at which the electrons can be regarded as zonal without taking into consideration the polar effects. Up to this limit the energy balance should be treated corresponding to polaron theory. The great advantage of polaron theory consists in the fact, that it not only operates with known parameters of the crystals: ϵ , n_0^2 , ω_0 and m^* . In the here performed investigations all quantities from previous papers on the theory of polarons and F-centres were employed. From this it appears, that the inconsistencies with the experiment are not very great. There are no references.

AVAILABLE: Library of Congress

1. Dielectrics---Phase studies 2. Dielectrics---Theory 3. Electrons---Applications

Card 4/4

BALYGIN, I. YE.

AUTHORS: Pisarenko, V. F., Balygin, I. Ye., 48-22-4-12/24
Fedoseyev, G. P., Tonkonogov, M. P., Fridberg, I. D.,
Tolpygo, K. B., Konorova, Ye. A., Skanavi, G. I.

TITLE: Discussions on Lectures by: S. M. Bragin, G. A. Vorob'yev
and A. A. Vorob'yev; L. A. Sorokina and Ye. A. Konorova;
V. D. Kuchin; Ye. A. Konorova, V. V. Krasnopevtsev and G. I.
Skanavi (Preniya po dokladam: S. M. Bragina; G. A. Vorob'yeva
i A. A. Vorob'yeva; L. A. Sorokinoy i Ye. A. Konorovoy; V. D.
Kuchina; Ye. A. Konorovoy, V. V. Krasnopevtseva i G. I.
Skanavi)

PERIODICAL: Izvestiya Akademii Nauk, SSSR Seriya Fizicheskaya, 1958,
Vol. 22, Nr 4, pp. 413-414 (USSR)

ABSTRACT: V. B. Pisarenko criticises the paper by G. A. Vorob'yev
and A. A. Vorob'yev. He maintains, that in the investigation
of the breakdown of colored rock salt the influence of space
charge was not taken into consideration. I. Ye. Balygin
maintains, that the experiments by Bragin are of great
importance, as little research has hitherto been conducted
in this field. In the lecture by Vorob'yev and Vorob'yev the
division of breakdown into two stages was not sufficiently

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Discussions on Lectures by: S. M. Bragin, G. A. Vorob'yev 48-22-4-12/24
and A. A. Vorob'yev; L. A. Sorokina and Ye. A. Konorova; V. D. Kuchin;
Ye. A. Konorova, V. V. Krasnopevtsev and G. I. Skanavi

proved. He considers the method by Sorokina to be unreliable. G. P. Fedoseyev states with respect to the lecture by Bragin: The results are to be considered of great practical interest. The investigation, however, is incomplete and therefore cannot be recommended for practical technology. M. P. Tonkonogov considers the lecture by Bragin as valuable for the clarification of the interconnection between the phenomena of dielectric losses and the phenomena of breakdown. I. D. Fridberg discusses the lecture by Bragin and communicates his own experience in this field. K. B. Tolpygo contests the results communicated in the lecture by Krasnopevtsev, Konorova and Skanavi. Ye. A. Konorova answers Balygin and states, that an overlapping of samples was impossible. Methodical modification in comparison to the thirties are represented by an employment of qualitatively better samples, purer raw materials and of a previous treatment as well as by the fact, that the measurements of breakdown voltage are conducted more accurately. G. I. Skanavi comments on the lecture by Vorob'yev and Vorob'yev and states that the attempt to obtain data on the second stage of

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Discussions on Lectures by: S. M. Bragin, G. A. Vorob'yev 48-22-4-12/24
and A. A. Vorob'yev; L. A. Sorokina and Ye. A. Konorova; V. D. Kuchin;
Ye. A. Konorova, V. V. Krasnopevtsev and G. I. Skanavi

breakdown proves to be of interest. The apprehensions of the
authors regarding this problem are to be noticed. Subsequently
he deals with some experiments of his own.
There is 1 figure.

AVAILABLE: Library of Congress

1. Scientific reports--Critic

Card 3/3

Balygin, I. Ye.

AUTHOR: Balygin, I. Ye.

48-22-4-16/24

TITLE: Electric Breakdown of Titanium-Containing
Ceramics With a Dielectric Permeability of 80
(Elektricheskiy proboy titan'soderzhashchego
keramicheskogo materiala s dielektricheskoy
pronitsayemost'yu 80)

PERIODICAL: Izvestiya Akademii Nauk SSSR, Seriya Fizicheskaya, 1958,
Vol. 22, Nr 4, pp. 427-432 (USSR)

ABSTRACT: In the investigation of the dielectric strength of the
titanates of barium and of the metals of the second period
of the atomic system a number of interesting regularities
were discovered in recent years (references 1 - 3). It is,
however, not yet decided, whether they are also
characteristic for other titanium-containing ceramic
materials. In order to obtain data bearing on this
problem, the author investigated the "Tikond" T-80.
This titanium containing ceramics primarily consists of
TiO₂ (~89%), SiO₂ (~3%), Al₂O₃ (~2%), ZrO₂ (3.9%) and

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Electric Breakdown of Titanium-Containing
Ceramics With a Dielectric Permeability of 80

48-22-4-16/24

of some other oxides. The shape of the test samples is given in figure 1. The experiments were conducted with pulsed voltages according to various circuit diagrams (Figures 2, a, b and c). From 7 to 15 samples were investigated under invariable conditions. The reproducibility of the oscillographs was quite satisfactory, allowing for statistical deviations. Figure 3 shows a series of oscillographs, which were taken according to the diagrams a and b at a temperature of 20°C. Figure 2 shows the oscillographs VII - IX, which were recorded according to diagram b ($r_0 = 167 \Omega$). Some data concerning the oscillographs I - V, are given in table 1, table 2 showing data concerning the oscillographs VII - IX. The average breakdown voltage E_{pr} of the samples as given by the oscillographs, was equal to 11 kV mm^{-1} . From the given data it can be seen, that the insulating properties of T-80 are practically not reduced after the first breakdown. Irreversible changes take place in the discharge channel, apart from the formation of a relatively well conducting

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Electric Breakdown of Titanium-Containing
Ceramics With a Dielectric Permeability of 80

48-22-4-16/24

bridge, presumably consisting of titanium. It appears from the oscillographs, that the so-called statistical time lag of breakdown without excess voltage is relatively great. It is known, that in solid as well as in liquid dielectrics the value of E_{br} depends on the material of the electrodes. (references 7 - 8). Therefore the quantity E_{br} must to a certain extent be dependent upon the emission or the thermionic emission of electrons. At a dielectric permeability of T-80 these conditions of such an emission are met with by the particularly fine silver threads, which are formed because of the silver diffusion during baking. The sintering of finely grained particles of the mass of T-80 proceeds at a temperature of 7350°C , that is to say, below the melting of basic oxides. Therefore it must be assumed, that the atoms of the dielectric do not take the position with the minimum of potential energy, and that the system is not in equilibrium. Separated crystalline cells are formed in the sintering of T-80, the size of

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Electric Breakdown of Titanium-Containing
Ceramics With a Dielectric Permeability of 80

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which depends upon the baking temperature. (figure 5)
There are 5 figures, 2 tables, and 15 references, 11 of
which are Soviet.

AVAILABLE:

Library of Congress

1. Barium titanates---Dielectric properties
2. Barium titanates
--Test methods
3. Test equipment---Applications

Card 4/4

Балыгин, И. В.

AUTHOR: Balygin, I. V.

48-22-4-17/24

TITLE: Some Rules Governing the Electric Breakdown of Liquid Dielectrics (Nekotoryye zakonomernosti elektricheskogo proboya zhidkikh dielektrikov)

PERIODICAL: Izvestiya Akademii Nauk SSSR, Seriya Fizicheskaya, 1958, Vol. 22, Nr 4, pp. 433-438 (USSR)

ABSTRACT: In the investigation of some liquid dielectrics interesting regularities were discovered in recent years (References 1-4). The mechanism of breakdown, however, has been little investigated as yet, and the phenomena connected with it remain unclear. Furthermore, the author gives some supplementary data obtained in the investigation of processes of breakdown in several liquid dielectrics. Figure 2 shows a series of oscillographs of the breakdown of various liquid dielectrics, comprising transformer oil, natural (condensor) vaseline (at 40°C) and not chlorinated organosilicon compounds. Table 1 gives some explanatory data concerning these oscillographs. The different picture of discharge in the investigated liquid dielectrics exists during the

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Some Rules Governing the Electric Breakdown of
Liquid Dielectrics

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occurrence of sudden deionization and of corresponding peaks, when a spark-gap restriking has taken place. Moreover, differences exist in the amplitudes of the peaks and in their width as well as in the moment of discharge interruption and in the voltage amplitudes at the interruption. All these peculiarities are certainly determined by the physical and chemical composition of the insulating substances and their structure. It was observed, that some liquids eject liquid from the interspace between the electrodes, the intensity of ejection being dependent upon the value of the discharge current (Reference 5). Most probable is the assumption, that this ejection in some cases is connected with a sudden deionization, if not ionized molecules penetrate into the zone of the discharge channel. It had to be assumed, that the character of deionization is dependent upon the viscosity of the liquid. In order to check on this problem, corresponding experiments were conducted. From 1 - 6% solutions of acetyl cellulose in toluene were disrupted. The oscillographs of breakdown are given in figure 3.

Some Rules Governing the Electric Breakdown of
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I - IV. Explanations concerning this are given in table 2. Moreover, experiments with benzene and xylene were performed. The concerning oscillographs are shown in figure 3, V - VI and explanatory data are given in table 2. There are 3 figures, 2 tables and 7 references, 3 of which are Soviet.

AVAILABLE:

Library of Congress

1. Liquids--Dielectric properties
2. Dielectric properties
- Determination
3. Oscillographs--Applications

Card 3/3

AUTHORS: Balygin, I. Ye., Yarushkin, V. D.

57-28-4-12/39

TITLE: The Influence of the Electrode Material and of the Field Shape Upon the Breakdown Voltage of Ceramic Dielectrics
(Vliyaniye materiala elektrodov i formy polya na probivnuyu napryazhennost' keramicheskikh dielektrikov)

PERIODICAL: Zhurnal Tekhnicheskoy Fiziki, 1958, Vol.28, Nr 4, pp.761-766
(USSR)

ABSTRACT: The following ceramic dielectrics were investigated here: Ultraporcelain (UF-46), Radioporcelain, steatite (B-17), Tikond T-80, Tikond T-150 and the Seignette-electric material T-7500. It is shown: 1) The breakdown voltage of ultra-porcelain and Tikon T-80 with electrodes of burnt-in platinum and silver as well of copper applied in a chemical way depends on the electrode-material. The highest breakdown-voltages are obtained in samples with electrodes of burnt-in platinum. 2) The degree of this dependence is determined by the temperature of the surrounding medium as well as by the chemical composition of the ceramics and by their

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57-28-4-12/39

The Influence of the Electrode Material and of the Field Shape Upon the Breakdown Voltage of Ceramic Dielectrics

structure. 3) The breakdown-voltage in electrodes of pressed-on silver tips and surface is higher than in the case of two surfaces of burnt-in silver. 4) In the case of negative pressed-on tips of different metals and a positive surface of burnt-in silver the breakdown-voltages of the ceramic samples is practically independent of the material of the tip. No dependence on the polarity of the tip in the breakdown-voltage is observed either. There are 4 figures, 4 tables, and 10 references, 8 of which are Soviet.

SUBMITTED: May 15, 1957

Card 2/2

AUTHOR: Balygin, I. Ye. 57-28-4-13/39

TITLE: Rules Governing the Electric Breakdown of Ultraporcelain Sub-
jected to a Pulsed Voltage (Zakonomernosti elektricheskogo
probоя ul'trafarfora pri impul'snom napryazhenii)

PERIODICAL: Zhurnal Tekhnicheskoye Fiziki, 1958, Vol. 28, Nr 4, pp. 767-773
(USSR)

ABSTRACT: The author made experiments with ultraporcelain (U-46) sub-
jected to a pulsed voltage. 10-20 samples respectively were
broken down under equal conditions. From the oscillograph of
the breakdown of samples with a thickness of 1,37-1,83 mm (?)
at 20°C is to be seen that the breakdown as a rule took place
without any essential delay at the leading edge of the pulse.
After the breakdown the voltage does not decrease to zero, but
remains constant at 1-2,3 kV/mm during 20-28 msec. The time of
formation of the breakdown also is characteristic. The entire
process is finished in about 10^{-8} sec. The average breakdown
voltage from a series of 16 pieces was 28,0 kV/mm. After the
first breakdown the dielectric properties of the samples are
to an essential degree restored. In breakdowns at 400°C the
time of formation lengthened up to $9 \cdot 10^{-8}$ sec. On a rise of

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Rules Governing the Electric Breakdown of Ultraporcelain
Subjected to a Pulsed Voltage

57-28-4-13/39

temperature from 20 to 400°C the breakdown voltage decreases to about half its former value. It is shown that in the discharge the fundamental part is not played by the thermal processes but by the avalanche-electrons and that the irreversible changes in the isolation in the second breakdown are indeed caused by the chemical action of the electrons. From the equation given here it is to be seen that on an increase in the slope of the leading edge of the pulse amplitudes the amount of the space charge at the cathode decreases. In the case of a slow rise of the amplitude, however, a larger number of electrons than in the case of pulses with short rise times can penetrate into the interelectrode-space of ultraporcelain. These electrons at the cathode form a negative space-charge. This will balance out the irregularity of field and the avalanches of electrons will then form in the ceramics at higher voltages. In the case of a very quick potential rise the influence of the space-charge does not produce any effect at all and the formation of the avalanches of electrons can start at lower voltages. The microphotograph of an ultraporcelain etched in HCl is given. One sees that the crystalline cells of indefinite form are separated by amorphous intermediate

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Rules Governing the Electric Breakdown of Ultraporcelain
Subjected to a Pulsed Voltage

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layers. By shrinkage during sintering a large number of vacancies may form in the ceramics. The periodicity in the regular structure of ultraporcelain is continuously disturbed by vacancies, dislocations and amorphous intermediate layers. Under such circumstances a considerable number of electron-capture-centers must also form. This number will increase on a rise of temperature due to an increase in the number of dissociated molecules. Therefore the time of formation of the breakdown must also lengthen. All this was retained in the experiments. There are 4 figures, 2 tables, and 19 references, 14 of which are Soviet.

SUBMITTED: April 4, 1957

Card 3/3

PLATE : BOOK REVOLUTION

SOV/4373

Vsesoyuznaya konferentsiya po fizike dielektrikov. 2d, 1958

Fizika dielektrikov; trudy vtoroy vsesoyuznoy konferentsii (Physics of Dielectrics. Transactions of the 2d All-Union Conference on the Physics of Dielectrics) Moscow, Izdat-vo AN SSSR, 1960. 524 p. Kravits slip inserted. 5,000 copies printed.

Sponsoring Agency: Akademiya nauk SSSR. Fizicheskii Institut Imeni P.N. Lebedeva. Ed. of Publishing House: Ye.L. Yanakovichskaya, Tech. Ed. I.M. Borzhinskii; Editorial Board: (Resp. Ed.) G.I. Shumov, Doctor of Physics and Mathematics (Deceased), and K.Y. Filipova, Candidate of Physics and Mathematics.

PURPOSE: This collection of reports is intended for scientists investigating the physics of dielectrics.

CONTENTS: The Second All-Union Conference on the Physics of Dielectrics held in Moscow at the Fizicheskii Institut Imeni P.N. Lebedeva (Physics Institute Imeni P.N. Lebedev) in November 1958 was attended by representatives of the principal scientific centers and of several other countries. This collection contains most of the reports presented at the conference and summaries of the discussions which followed. The reports in this collection deal with dielectric properties of various crystals, glasses, polymers, and with specific properties of various compounds, and with specific properties of various compounds. Reports on dielectric properties of various compounds, and with specific properties of various compounds are investigated. The volume contains a list of other papers presented at the conference dealing with polarization, breakdown, and breakdowns of dielectrics, which were published in the journal Izvestiya AN SSSR, seriya fizicheskaya, No. 1 and 2, 1960. In parentheses are mentioned references accompany each report.

Tridits, V.M. Development and Investigation of Certain Dielectrics Possessing a High Electrophotographic Sensitivity [Institute of Crystallography, AN SSSR, Moscow]

Discussion

Obukhov, I.A., M.M. Vrubel'skiy, and I.N. Fed'ko. Effect of Heat Treatment on the Electrophysical Properties of Certain Alkali-Free Silicate Glasses 170

Iskoff, I.A., and I.S. Isomchikov. Dielectric Properties of Certain Crystal Aluminosilicates [Institute Imeni P.N. Lebedev AN SSSR (Institute of Crystal Chemistry, AN SSSR)] 182

Medvedev, E.A. Effect of the Sorption Shape of the Water Bond on the Electrical Properties of Organic Dielectrics 194

* Medvedev, E.A. Dielectric Losses in KBrO₃ 207

Kozlov, I.A. Dielectric Properties of Gaseous Crystals [Physicochemical Faculty of Moscow State University, Moscow] (Physics Division, Moscow State University Imeni M.V. Lomonosov) 211

Discussion

Boys, G.V., and M.I. Reymann. Electrical and Mechanical Properties of Ion Poly-crystalline Dielectrics in Connection With Their Heat Treatment 220

Korshak, S.H., and A.M. Tolstun. Third Kind of Thermal Breakdown [Leningrad Polytechnical Institute Imeni M.I. Kalinina (Leningrad Polytechnical Institute Imeni M.I. Kalinina)] 230

Torsh'yer, A.A., and E.K. Sanchik. Some Regularities of Discharge Delays in Solid Dielectrics [Tomsk Polytechnical Institute Imeni S.M. Kirova (Tomsk Polytechnical Institute Imeni S.M. Kirova)] 235

Berzhanskii, I.A., and M.A. Molodtsov. On the Possibility of a Stream Discharge Mechanism in Solid Dielectrics [Tomsk Polytechnical Institute Imeni S.M. Kirova] 247

* Molodtsov, M.A. Investigation of the Pulse Fracture of Certain Polymers and Rice [Tomsk Polytechnical Institute Imeni S.M. Kirova] 256

Balygin, I.Ye. On Certain Post-Fracture Processes in Liquid Dielectrics 262

* Balygin, I.Ye. Investigation of Discharge Dynamics in Distilled Water 271

Discussion

Fed, B.M., and S.Y. Bogdanov. Effect of Unilateral External Pressure on Domain Orientation in "Polarized" Polycrystalline BaTiO₃ [Physics Institute Imeni P.N. Lebedev, AN SSSR, Moscow] 281

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S/181/60/002/008/006/045
B006/B070

24,7500

AUTHOR: Balygin, I. Ye.TITLE: The Creeping of Silver on the Surface of Ceramic
Dielectrics ✓

PERIODICAL: Fizika tverdogo tela, 1960, Vol. 2, No. 8, pp. 1723-1728

TEXT: It is known that under the influence of electric potential silver diffuses from the electrodes into ceramic dielectrics and spreads on the surface causing a noticeable deterioration in the insulation properties of the dielectric. The author investigated this effect in ultra-porcelain of the type УФ-46 (UF-46), radio porcelain of the type РФ (RF), and corundum-mullite ceramic of the type КМ-1 (KM-1). To accelerate the migration process the experiments were performed at 400°C. The shape and size of the samples is shown in Fig. 1; their chemical composition is given in Table 1. The silver electrodes were at the center of the disk-shaped samples. Fig. 2 shows photographs of samples of UF-46 after testing with a potential of 3 kv at 400°C. The

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The Creeping of Silver on the Surface of
Ceramic Dielectrics

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B006/B070

explanations of the photograph are given in Table 2. Fig. 3 shows further photographs of samples of KM and UF with silver and platinum electrodes for different times of the passage of current. The numerical data are given in Table 3. Fig. 4 shows a graph of a typical form of the spreading of the silver atoms on the surface of the sample. Experiments showed that, not only the silver from the silver anode, but also that from the silver wire, tightly connected to the dielectric, spreads on the surface. A trapping of valence electrons on silver atoms through surface traps appears to be the most probable mechanism of ionization. On their way to the cathode the Ag^+ ions, after recombination, are deposited in the shape of dendrites with branches in the direction of the anode (Fig. 4, VII-Fig. 2); the branchings could also be directed towards the cathode (VI-Fig. 3). There are 4 figures and 10 references: 6 Soviet and 1 US.

SUBMITTED: March 23, 1959 (after revision)

Card 2/2

9.2540

5.1230

AUTHOR:

Balygin, I. Ye.

TITLE:

The Heat Conduction¹ of Some Dielectrics¹ in the Electric Field¹

PERIODICAL:

Inzhenerno-fizicheskiy zhurnal, 1960, Vol. 3, No. 3, pp. 54-58

TEXT: In the present paper, experiments are described, in which the heat exchange between non-uniformly heated layers of transformer oil was investigated by means of the experimental set-up shown in Fig. 1. In a container of 140 mm diameter there are two ball electrodes. The upper one may be heated and fed with a high voltage of 80 kv. The lower electrode has mass potential. The temperature of the oil on the surface and the temperature of the lower electrode is measured. First, the upper electrode was heated for 2.5 hours, after which a high voltage was applied to it. From the measurements shown in Fig. 2 it may be seen that during the heating period (without high voltage) the temperature on the upper electrode rose from 20° to 110°C, and on the lower one from 20° to 26°C. After the voltage had been applied, the temperature in the upper layers was 67°C after 7 minutes, and on the lower electrode it was 65°C. 58 minutes after switching off the voltage a state similar to that before switching it on was established: 117° and 40°C, respectively. As the experiments further showed,

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The Heat Conduction of Some Dielectrics in the
Electric Field

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B014/B007

the resistance of the upper layer at 110°C decreases from $2.6 \cdot 10^{14}$ to $8 \cdot 10^{12}$ ohm/cm. It is shown in the discussion of these results that the quantity of energy transferred is low also in consideration of the increase in ion mobility, and that also if the field strength is taken into account, the increase of electrical conductivity is low. The possibility of a dissociation of greater quantities of molecules at temperatures of more than 100°C is investigated, in which connection a catalyzing effect of the brass surfaces of the electrodes is not considered to be impossible. From these considerations the conclusion is drawn that the ions move between the electrodes under the influence of the electric field, thus determining the intensity of the heat exchange. Experiments made with alternating voltages on the upper electrode confirm this opinion. Fig. 4 shows that with alternating voltage of the upper electrode, the temperature on the lower electrode does not change. There are 4 figures and 9 references: 1 Soviet, 2 German, 1 French, and 5 English. X

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BALYGIN, I. Ye.

S/170/60/003/008/002/014
B019/B054

AUTHOR: Balygin, I. Ye.
TITLE: On the Temperature of the Spark in the Test of Liquid Dielectrics
PERIODICAL: Inzhenerno-fizicheskiy zhurnal, 1960, Vol. 3, No. 8, pp. 19-25

TEXT: The author derives the approximate formula (14) for the energy released in the discharge in a liquid dielectric; the temperature of the spark at the breakdown of a liquid dielectric can be graphically determined from this formula. The formula was checked by experiments on transformer oil. Fig. 1 shows two experimental circuits with which the experiments were carried out, and Fig. 2 shows oscillograms of tests on transformer oil. One of them was taken without test of the spark space (Fig. 1a), the other with test of the spark space (Fig. 1b). It is shown that the temperature values calculated lie within reasonable limits; on the basis of formula (14) the author considers the physical and chemical processes in the breakdown in transformer oil. He studies

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On the Temperature of the Spark in the
Test of Liquid Dielectrics

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the dissociation of the molecule $C_{20}H_{40}$, the ionization of CH_4 , the
free path of electrons, the radius of the discharge channel, the
dissociation of H_2 and C_2 , and the recombination of H- and C-ions into
molecules. There are 3 figures and 24 references: 22 Soviet, 1 French,
and 1 US. ✓

SUBMITTED: January 14, 1960

Card 2/2

S/057/60/030/04/06/009
81109
B004/B002

9.3150

AUTHOR: Balygin, I. Ye.TITLE: Some Processes in the Air After DischargePERIODICAL: Zhurnal tekhnicheskoy fiziki, 1960, Vol. 30, No. 4,
pp. 433-441

TEXT: The author investigated the voltage change in electric discharges in the air between spheres by means of a high-voltage cathode oscilloscope. Fig. 1 gives a scheme of the test circuit. Fig. 2 shows the oscillograms, and Table 1 the corresponding values of resistance, breakdown voltage, and current strength. The author discusses the voltage fluctuations observed in the course between 0 and 1060 μ sec, which were simulated by means of a circuit (Fig. 3), by connecting various resistors. Figs. 4 and 5 show the change of resistance and current strength in the discharge gap within a certain period of time. For the investigation of discharge dynamics in strongly ionized and inhomogeneous electric fields, discharges between a point (negative pole) and a plane were investigated (oscillograms Fig. 6, data Table 2, circuit for calculating

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81109

Some Processes in the Air After Discharge

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B004/B002

the maximum current: Fig. 7). The author derived equations for the individual discharge phases, and obtained the following results: 1) with a certain restriction in the discharge current, intensive deionization processes occur immediately after the sparkover of 2-6 mm air intervals in the spark gap. Then, their intensity decreases and rapidly increases again, after the interruption of the discharge; 2) during the reduction of the deionization intensity, particular conditions develop in the plasma of the spark gap, under which the electrode voltage remains almost constant for a long period of time, while the pulse amplitude exhibits a steep decline; 3) highly frequent sinusoidal oscillations may occur at a certain restriction of the discharge current after the sparkover in the spark gap; 4) in ionized air, the sparkover is considerably reduced, also when the field is homogeneous. There are 7 figures, 2 tables, and 2 Soviet references.

SUBMITTED: November 2, 1959

Card 2/2

S/181/61/003/001/019/042
B006/B056

AUTHOR: Balygin, I. Ye.

TITLE: Penetration of silver into amorphous and crystalline quartz
under the action of a constant voltage

PERIODICAL: Fizika tverdogo tela, v. 3, no. 1, 1961, 156-166

TEXT: The mechanism of the penetration of silver into certain dielectrics under the action of a constant field has hitherto not been fully explained. The present paper is intended to make a contribution to the clarification of this problem. Part of the experiments described here were carried out with the radioisotope Ag^{110} , and the β - and γ -activities were determined by means of a Geiger-Müller end-window counter and a 5-2 (B-2) counter. 1.5 mm thick plates made from amorphous quartz were, on one hand, coated with an inactive paste, on the other hand, active silver from $\text{Ag}^{110}\text{NO}_3$ was circularly ($d=12$ mm) applied to the anode. For the reduction of the metallic silver, the specimens were heated at $t=400^\circ\text{C}$ for 30 min. Penetra-

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Penetration of silver into...

S/181/61/003/001/019/042
B006/B056

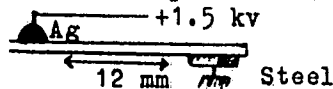
tion of Ag^{110} atoms into the quartz manifested itself by a decrease of the β -intensity, whereas the γ -intensity, which was measured only for purposes of control, remained nearly unchanged. In a field of 660 v/mm, practically no penetration of silver into quartz could be found at 300°C, whereas at the same temperature and 1.7 kv/mm, this occurred quickly (exponential drop of the β -intensity curve). After about 50 hr, practically the entire silver had penetrated into the quartz (in the form of positive ions). A similar effect as produced by the field was also produced by temperature: At elevated temperature (400°C), also at 660 v/mm a quick penetration of silver could be observed; the effect of temperature alone caused a hardly noticeable penetration. In order to determine the state of silver (atomic or ionic) inside the quartz, experiments were made at 400°C and 1.7 kv/mm. They showed that the greater part of silver in quartz was ionized (Ag^+). In order to be able to observe the penetration of silver visually, quartz plates (25·25·6 mm³) were polished on all sides until they became fully transparent. An inactive silver layer served as anode, and stainless steel as cathode (earthed). At $t \geq 400^\circ\text{C}$, the main part of the silver, thermally introduced before the experiment, migrated to the cathode, where it was

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accumulated in the form of branched dendrites. After some time, metallic silver had accumulated on the cathodic side of the quartz plate in many shapes growing into the plate like bunches of grass. The various arrangements of these dendrites were photographed in experiments between 400-700°C. At 500°C, the various branched bunches were distinctly seen to grow together, and between these bunches arc-like connections were established at a certain depth of the quartz plate. The higher the temperature, the more quickly the dendrites developed. An experiment undertaken with a 20 mm thick quartz plate at 600°C produced 17 mm high "bushes" within 250 hr; voltage during this time was reduced from 3 to 1.8 kv. In the case of alternating voltage, no effect was attained. Further investigations of the quartz structure and the Si-O bonds were carried out, and numerous microphotographs are shown and discussed. Analogous experiments were carried out also with crystalline quartz at 400°C and 430 v/mm. 3.5 mm thick quartz plates were used, which were cut under 35° to the major axis. Microphotographs IV and V show specially long, distinctly marked dendrites which branch from the cathode. Experimental arrangement:



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The dendrites shown here had fully developed within 3 hr. These studies showed that the migration of silver in quartz crystals takes place easily and quickly. There are 10 figures, 2 tables, and 10 references: 3 Soviet-bloc and 6 non-Soviet-bloc. ✓

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